

Mobility & Intermodal Planning

Research has been conducted on transportation efficient development, pedestrian infrastructure, incident management, freight movement, and multi-modal investment analysis. Current research addresses understanding land use and transportation interactions, developing traveler information systems, evaluating HOV lanes, understanding intermodal truck-rail facilities, improving data collection, and improving freeway flow analysis.

Topics that need additional research in the planning arena include: land use and growth management; concurrency as it affects state highways; methods to mitigate effects of development on the transportation system; understanding the economic effects of goods movement and the transportation needs of the economy (freight movement, tourism) and regionally adopting new technologies; environmental stewardship and streamlining; consensus building and collaborative decision-making techniques/processes; and, travel forecasting based on actual customer practice.

Design & Safety

Design and Safety research includes: roadway/roadside safety; design standards; roadside development; hydraulics; context sensitive design; and, access management.

Research activities have focused primarily on understanding and addressing conditions that lead to accidents and hydraulic issues that address stormwater, scour at in-water structures, and streambank stabilization. The results of research have been used to update agency manuals and have contributed to updates to national standards.

Research needs include: highway, pedestrian, and bicycle safety research; stormwater treatment methods; context sensitive design; project delivery tools; cost management; roadside management; and, design/build methods.

What are the benefits of research activities?

Research results have greatly improved the longevity of pavements, the safety of road design, and the speed and safety of construction methods. A handful of examples are illustrated below:

- Between 5 TV stations and WSDOT's own website, about 44,000 people per day visit the Puget Sound Traffic information Web sites to check traffic conditions before they start their journeys (www.wsdot.wa.gov/pugetsoundtraffic). Freeway operations research led to the real time video of freeways and the traveler information system and more accurate congestion maps.
- Materials research has improved the longevity and performance of pavements and provided a reduction in cost, improved work methods, and safer performance.
- Research conducted on eelgrass provided Washington State Ferries with information needed to streamline permit negotiations.
- Seismic research for structures is the base of our seismic retrofit program today.
- Research on a new and highly sophisticated Ramp Metering Algorithm led to decreased mainline congestion and increased flow on I-90. On I-405, the ramp queues decreased significantly and mainline congestion increased only marginally.
- WSDOT's dowel bar retrofit program saves an estimated \$90,000 per lane mile of asphalt overlay. As of 2003, over 275 miles of Portland Concrete Pavements (PCCP) have been retrofitted using dowel bars, with another 100 miles to be completed in the next 5 to 10 years. Approximately 150 additional miles will be completed over the next 10-20 years.

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CONSTRUCTION & MATERIALS • TRAFFIC MANAGEMENT • ENVIRONMENT • DESIGN & SAFETY



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Transportation Research

A program of systematic inquiry designed to address specific problems and questions to improve the agency's ability to deliver transportation projects and to operate a safe and efficient transportation system.

Why conduct research and development projects on transportation?

To better understand why certain problems occur and how to prevent or correct them through improved information or technology. The end result is an increased ability to deliver and operate the state’s transportation system.

How do we fund transportation research?

Organized federal research efforts began in 1893. Direct federal funding to states for transportation research began in 1934, and has seen changes over time to funding formulas. The Transportation Equity Act of the 21st Century (TEA- 21) requires that at least 25% of federal state planning and research (SPR) funds be directed to research and to receive a 20% state match.

Washington Department of Transportation (WSDOT) Research

At WSDOT, the Research Office manages the research and development program, which includes the Federal SPR program and other federal and state funded research. In all, WSDOT directs 113 projects (63 SPR, 23 FHWA pooled fund, 25 contract, 2 grants) for a total of \$16 million dollars.

The Research Office also includes the WSDOT Library which manages a collection of books, manuals, technical reports, legal reference materials, standards, journals, and online resources on virtually every transportation-related subject. The WSDOT Library supports staff, consultants and contractors by finding information on a topic, developing search strategies, locating facts and statistics, identifying information additional sources and obtaining articles and books through inter-library borrowing.

Since 1972, the WSDOT Research Program has produced over 800 research reports.

What type of research is conducted?

Bridges & Structures

WSDOT’s Bridge & Structures Office is one of the best in the country. The bridge research program focuses on designing of state-of-the-art bridges, managing the bridge inventory and protecting structures from damage by natural disasters like earthquakes and floods.

Direct results of the bridge research program over the past 20 years include a ground-breaking bridge deck management system, seismic retrofit strategy to reduce the vulnerability of our bridges, and participation in FHWA’s High Performance Bridge Program, which increased use of higher strength girders that have increased the span, reduced the number of piers and reduced environmental impacts. Current research includes studies in rapid construction and seismic retrofit.

Additional research is needed in seismic retrofits, rapid construction methods, non-destructive inspection regimes and security measures. Longer-term needs include developing alternative materials such as composition materials.

Highway Operations

Highway Operations includes traffic management and maintenance.

Research has focused on developing techniques to accurately count traffic using available sensors, improving access to weather-related information and monitoring freeway traffic conditions.

Other research has been conducted on the state’s incident management program, using voice recognition for a statewide 511 traveler information line, installing electronic seals on commercial freight containers to speed US Customs handling, and using technology to allow safe and legal trucks to bypass weigh stations.

Current research activities include providing data from existing technologies for use with variable message signs and highway advisory radio systems; investigating the use of buses to monitor travel times; collecting data on freight movement and expanding systems for archiving roadway data or turning it into useful performance measures.

Construction & Materials

Past research has resulted in a variety of improvements to new mix, pavement design and management systems; the development of design criteria for cut slopes in loess soils, a formula on the load carrying capacity of driven piles, and completion of a seismic zone map.

Current research focuses on the use of geosynthetic fabrics to reinforce of walls, liquefaction hazards, wiremesh and cabledmesh slope protection design criteria, changing the pavement management system from a PC based system to an Internet based system, new design guidelines for the mixes and placement methods for Portland cement concrete pavements, and a compilation of case histories on rapid construction methods.

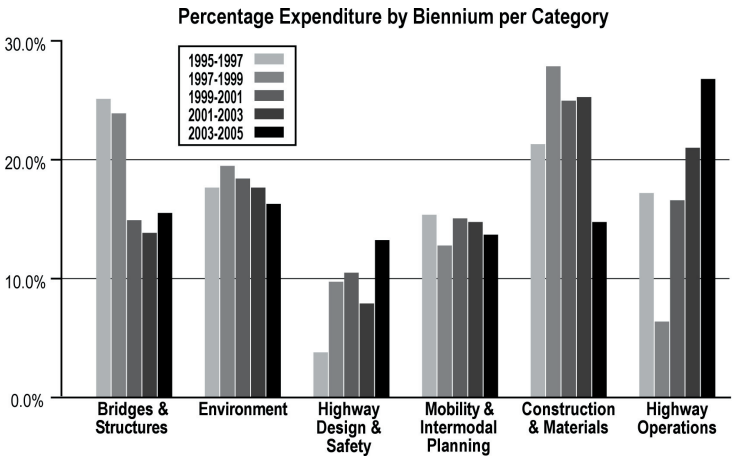


A contractor installs dowel-bar retrofits to extend the life of white pavement.

Research needs include studies on marginal soils; seismic issues; liquefaction of soils; structural design and analysis tools; pavement materials, performance, rehabilitation of major urban corridors, construction; and, information systems and training.

How have we spent research funding?

Research and development activities address six functional areas: Bridges & Structures; Highway Operations; Environment; Design & Safety; Mobility and Intermodal Planning; and, Construction and Materials. Research activities address all modes although the primary focus has been on products for the highway system. Funding has varied by year depending on agency needs and opportunities.



Environment

Environmental research helps WSDOT maintain and improve the environment where new projects are built. Research contributes to a common foundation for decisions between WSDOT, permitting agencies and others, thus avoiding unnecessary re-design, schedule delays and cost increases.

In recent years WSDOT has focused its environmental research efforts on stormwater run-off and water quality and on species issues such as wildlife migration corridors, the impact of salt on endangered plants, and the impact of overwater structures on eelgrass and salmon. Literature reviews have been conducted on species listed or about to be listed under the Endangered Species Act to understand the potential impact of transportation activities. Results have been used to update agency manuals and to streamline permitting decisions.

Environmental research subjects span the breadth of environmental issues covered in the National Environmental

Policy Act (NEPA) and other federal, state, and local environmental regulations. Potential research subjects include impacts to and mitigation strategies for: fish, wildlife, and plant species; air quality; noise; water quality; wetlands; cultural and historic resources; hazardous materials; socio-economic issues; land use; and visual quality. Priorities for research include addressing common project delays due to questions on environmental parameters and methods that streamline the environmental review process to expedite project delivery while meeting the environmental requirements are priorities.



A WSDOT biologist stands next to new culverts designed to improve fish passage.

Who’s doing Transportation Research in Washington?

Washington Transportation Center (TRAC)

In 1983, WSDOT, the University of Washington and the Washington State University formed a partnership that established the Washington Transportation Center (TRAC). TRAC provides a link among the government, university researchers, and the private sector. TRAC acts as a liaison, connecting those who need applied research at WSDOT with those best suited to conduct it at the universities. TRAC also conducts research for other institutions upon request such as local government, Metropolitan Planning Organizations, and other institutions.

Transportation Northwest (TransNow)

TransNow is one of ten regional research centers of the National Transportation Centers Program. A consortium of six universities from four northwest states cooperates in this coordinated research and educational effort. The University of Washington is the lead of the consortium that includes the University of Alaska Fairbanks, the University of Idaho, Oregon State University, Portland State University, Washington State University, and the University of Washington.

TransNow is interested in research and educational programs that fall under the theme of “Operations Management and Planning.” Sub-areas include traffic operations, transit operations, and intermodal or other-modal operations.